

UNDERMOUNT DRAWER SLIDE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] Not applicable.

5 STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable

BACKGROUND OF THE INVENTION

[0003] The present invention relates to undermount drawer slides, e.g., telescoping slide
10 rails for suspending a drawer within a cabinet. More specifically, the present invention
relates to heavy duty drawer slides that are mountable underneath the bottom of a drawer
in a manner where the drawer slide is largely unexposed to view when the drawer is
opened.

15 [0004] Undermount drawer slides of the type described herein, became a factor in drawer
slide products during the 1980's. During this period, and extending to the present time,
undermount drawer slides have been associated with European cabinet applications and
the predominant undermount drawer slide manufacturers during this period of time have
been European as well. These include companies like Julius Blum Gesellschaft, M.B.H.
20 ("Blum"), Paul Hettich GmbH & Company ("Hettich"), MEPLA-Werke Lautenschlager
GmbH & Company (MEPLA"), Hafele GmbH & Company ("Hafele"), Alfit
Aktiengesellschaft ("Alfit"), and Grass GmbH ("Grass"), to name a few. These
manufacturers have taken similar approaches with respect to the configuration of the

typical undermount slide although the means by which the telescoping members interact and the features that they include vary from each company. The Blum slides, for instance, use member profiles that are compatible with cylindrical rollers that are positioned in between the members. Other slide designs have used ball bearings, nonetheless, the designs share a common functionality in that the working loads are supported by the components and ultimately transmitted to the cabinet.

[0005] The typical undermount drawer slide of the type that is the subject of the present application is based on the inclusion of two or three telescoping members (or rails) which are connected between a drawer body and a cabinet. The drawers typically are comprised of two sidewalls, a bottom, a drawer back and a drawer front. The cabinet is usually fabricated from one of two main approaches. The first is the face frame method where a skeletal frame of wood is constructed and the exterior is paneled with wood sheet, quite often plywood, resulting in an enclosed cabinet that can be finished for a furniture quality appearance. The second method is a frameless construction where wood panels, again typically a plywood material, of sufficient thickness are fastened together to form the enclosed cabinet product. Like the first method, the resulting product can be finished and made to resemble a high quality furniture piece.

[0006] Whichever method is used, the resulting cabinet housing, or carcass, is then ready for completion with the installation of the drawer suspension system, any doors, or any other features or accessories as may be required. In the process, the selection of an undermount drawer occurs when the application is suited for medium or heavy duty

loads, or where the desired objective is to reduce or minimize the exposure of suspension hardware to the end user, or where the requirement calls for the superior action of the undermount slide which is far smoother and easier in its movement than other slides designs that might be considered.

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[0007] The functionality of the undermount drawer slide has steadily improved since its entry into the marketplace in the early 1980's. A typical application, as has been disclosed in U.S. Patent No. 6,015,199, is shown in the present application in FIG. 1 where cabinet 10 includes a number of suspended drawers 12. The cabinet is further enclosed by the sidewalls 14, top 16 and a bottom and a back (not shown), all of which comprise the carcass. The drawer(s) are made up of the drawer front 18, the drawer sides 20, the drawer bottom 24 and the drawer back 26. The drawer pull 28 is used to move the drawer from a closed position to an open position and vice versa.

15 [0008] In FIG. 1, the drawer is suspended within the carcass by means of the undermount drawer slide 30 which includes the drawer member 32, the intermediate member 34 and the cabinet member 36. As may be realized from the drawing, the cabinet member has an overall "L" shaped profile that projects outwardly from the sidewall of the carcass. The intermediate and drawer members ride on the outboard
20 portion of this "L" configuration, allowing for sufficient clearance for the drawer member to be affixed to the underside of the drawer bottom. In this fashion, the drawer is adequately supported and the drawer slide system remains largely unexposed. In this illustration, the undermount drawer slide utilizes three members although it is understood

that two members may be used, and conversely, more than three could be used, although the most prevalent slide in use is the three-membered version. It is also understood that when referencing “drawer slides” or “undermount drawer slides” the conventional application is to use a pair of such slides, each one attached to opposing sidewalls of a drawer and the corresponding sidewalls of the carcass, notwithstanding references herein to the singular “drawer slide” or “undermount drawer slide.” Wherever such terms are used whether in singular or plural, it is assumed that a pair of such assemblies would be used in the suspension of the drawer.

[0009] Accessory features that have been integrated into the undermount drawer slide design include a self-close function. Various devices have been developed to promote a closing bias in a drawer slide once it approaches the fully closed position. However many of these versions suffer from a variety of problems, including noise, binding, durability, ease of assembly, to name just a few. One example of such prior art device is found in U.S. Patent No. 5,364,179 where a spring activated self-closer is disclosed. The ‘179 device is structurally similar to the self-closer of the present invention, however it also has deficiencies that have been overcome by the Applicant’s invention. Most notably, the ‘179 self-closer relies upon the surface of cabinet member to which it is mounted to form a part of the enclosure for keeping the spring and for retaining slidable components within the body of the self closer. This also means that the prior art device has to be assembled within close proximity to the drawer slide itself and is not easily subject to being assembled beforehand and certainly not as a stand-alone completed unit.

[0010] Another feature that has been developed to enhance the undermount drawer slide design is the inclusion of dampeners for cushioning the impact of the drawer slide components when hitting a stop placed at a stopping point on a member. The dampener feature assists in reducing the noise associated with the opening and closing of the drawer slide as well as reducing the severity of impact upon various components thereby increasing durability. One example of this feature is shown in U.S. Patent No. 6,015,199 where roller carriages with integrated dampeners are provided in the undermount drawer slide assembly. The present invention also includes a dampener of an improved design that further reduces the effects of impacts on the stop elements in a manner that is more beneficial to the life and durability of the slide assembly.

[0011] Another feature that has become associated with the undermount drawer slides in particular, is the usage of a reversible connector between the bottom of the drawer and the drawer member of the slide. This function became popular as the undermount drawer slide was accepted into more and more applications and eventually a method was needed to allow the end user to occasionally remove a drawer from the cabinet. One problem that developed with the usage of such a device, however, was the need to adjust the height or placement of the drawer. Several solutions have been offered to provide vertical adjustment of the drawer in such applications, one such example being the embodiment associated with the quick connect device taught in U.S. Patent No. 5,580,139. The usage of the wedge shaped adjustment means in this version provides crude vertical adjustments much like the use of a “shim” in wood carpentry for alignment of casings and the like. This and the other adjustment methods suffer from a lack of

precision and stability and do not normally retain their adjusted position, or at least fail to do so affirmatively, when the drawer is removed from the cabinet. These and other deficiencies found in the prior art have been overcome by the embodiments of the present invention.

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[0012] Additional deficits and problems of the prior art have been addressed by the embodiments of the present invention will be illustrated and discussed below.

SUMMARY OF THE INVENTION

10 [0013] The present invention comprises a novel undermount drawer slide that has an improved self-closer. More particularly, the self-closer of the present invention is comprised of a body that encloses a spring, where the body further includes provisions for the guiding and retention of a shuttle that is actuated by an engagement device located on the drawer member of the undermount drawer slide. The shuttle is connected to the
15 spring and is biased in a closing direction and is also movable between a closed position and a cocked or open position. The self-closer is compatibly mounted on the cabinet member in alignment with the engagement device located on the drawer member. One improvement in the self-closer is the inclusion of an integrated bottom portion for the self-closer body that fully encloses the spring and a portion of the shuttle.

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[0014] The present invention also includes an integrated bottom for a self-closer that provides a surface for the shuttle to rest on while transitioning from its closed position to a cocked or open position and vice versa.

[0015] The present invention also includes an integrated bottom for a self-closer that has a living hinge for ease of manufacturing the assembly as a one-piece construction.

5 [0016] Another embodiment of the present invention is an improved dampener for the roller carriages for reducing the noise and force of impact when the undermount drawer slide members contact stop elements. The improvement in the dampener of the present invention includes, at least, the inclusion of at least one elliptically shaped coil element positioned to contact a stop element of the undermount drawer slide and to absorb the
10 shock of any impacts.

[0017] The present invention also includes a dampener for a roller carriage that has a contact face that evenly spreads the impact force when meeting a stop element.

15 [0018] The present invention also includes a roller carriage with a web portion that is comprised of openings that reduce the amount of material needed to fabricate the carriage and which also allow for elastic absorption of an impact force.

[0019] In another embodiment of the present invention, an undermount drawer slide is
20 provided with a quick connect device for the reversible mounting of a drawer onto a drawer member. The improvement in the quick connect device comprising a vertical adjuster that affirmatively and precisely allows for vertical adjustment of the drawer relative to the undermount drawer slide assembly.

[0020] The present invention also includes a quick connect for an undermount drawer slide that has an infinite adjustments within its range.

5 [0021] The present invention also includes a quick connect for an undermount drawer slide that retains its adjusted position when a drawer is removed and until it is reinstalled, thereby eliminating the need for new adjustments.

[0022] These and other benefits and attributes of the present invention will be further
10 explained and disclosed herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] FIG. 1 is a perspective view of a representative cabinet with prior art undermount drawer slides installed on a drawer.

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[0024] FIG. 2 is a partial cross sectional view of a prior art undermount drawer slide as installed onto a drawer and in a position to be installed onto a carcass.

[0025] FIG. 3 is a side elevational view of an undermount drawer slide as mounted onto a
20 face frame and where the drawer slide assembly is in the closed position.

[0026] FIG. 4 is a side elevational view of an undermount drawer slide as in FIG. 3, however it is shown in the open position and as it relates to a sidewall and drawer front of a drawer.

5 [0027] FIG. 5 is a front elevational view of the profile of a drawer member of the present invention.

[0028] FIG. 6 is a front elevational view of the profile of an intermediate member of the present invention.

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[0029] FIG. 7 is a front elevational view of the profile of a cabinet member of the present invention.

[0030] FIG. 8 is a front elevational view of a rear mounting bracket of the present

15 invention.

[0031] FIG. 9 is a front elevational view of a cabinet member of the present invention with a bottom carriage installed thereon.

20 [0032] FIG. 10 is a perspective view of a cabinet member of the present invention with a bottom carriage installed thereon.

[0033] FIG. 11 is a perspective view of an intermediate member of the present invention with roller carriages mounted thereon.

[0034] FIG. 12 is a top view of a drawer member of the present invention.

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[0035] FIG. 13 is a side elevational view of a drawer member of the present invention.

[0036] FIG. 14 is a perspective view of a bottom carriage of the present invention.

10 [0037] FIG. 15 is a perspective view of a roller carriage of the present invention with dampeners.

[0038] FIG. 16 is a perspective view of a quick connect of the present invention.

15 [0039] FIG. 17 is a perspective view of a toggle component of the present invention.

[0040] FIG. 18 is a perspective exploded view of a quick connect of the present invention.

20 [0041] FIG. 19 is a perspective view of the front portion of a drawer member engaging a quick connect device of the present invention.

[0042] FIG. 20 is a top schematic view of a portion of a drawer slide assembly of the present invention showing a self closer in the closed position.

5 [0043] FIG. 21 is a top schematic view of a portion of a drawer slide assembly of the present invention showing a self closer in the open position.

[0044] FIG. 22 is a perspective view of a self closer of the present invention as shown from the shuttle side.

10 [0045] FIG. 23 is a perspective view of a self closer of the present invention as shown from the living hinge side.

[0046] FIG. 24 is a side elevational view of the body of a self closer of the present invention.

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[0047] FIG. 25 is a perspective view of a shuttle of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0048] A novel undermount drawer slide of the present invention is premised upon the
20 telescoping members typically associated with drawer slides of this type as shown in FIG. 1 and as discussed above. This arrangement is shown with more detail in FIG. 2 where the elements of the subject drawer slide and its relationship to a drawer are illustrated.

[0049] Specifically, the undermount drawer slide **30** is comprised of the drawer member **32**, the intermediated member **34** and the cabinet member **36**. Shown hidden behind the drawer back **26** is the drawer member tab **38** with drawer member tab point **40** with tapered point sides **42**. The drawer member tab point and a substantial portion of the drawer member tab projects through the drawer back mounting hole **44** which is shown in its mounted position. The drawer back wall **26** is indicated as being coextensive from the drawer side **20** to the drawer bottom **24** and ultimately to the opposing drawer side (not shown). The typical drawer construction is indicated where the drawer side is routed to provide a mounting slot for the drawer bottom, which itself is recessed from the bottom of the drawer side somewhat, thus providing the clearance for installing the undermount drawer slide.

[0050] Continuing, the bottom carriage **46** is shown along with the roller carriage **48** and a bottom carriage stop **50**. The cabinet member mounting flange **52** is illustrated in a position in which it would be mounted onto the right hand side of a carcass and includes cabinet member mounting flange holes **54**, cabinet member gusset **56**, the cabinet member flange **60** and the cabinet member side stop **62**.

[0051] The intermediate member **34** is shown with intermediate member stop **64** and is telescopically oriented in between the cabinet member and the drawer member **32**. The self closer pin **66** is shown in position to engage the self closer (not shown). Lastly, the drawer member side flanges **70** are disposed on the sides of the drawer member and are

virtual mirror images, and with the drawer member web 72, and the drawer member front flange, they all form the profile of the drawer member.

[0052] Turning now to FIGS. 3 and 4, an undermount drawer slide of the present

5 invention is disclosed as installed between a drawer and a carcass. In this instance, the representation shows a frame mounting type of installation. Specifically, the face frame 100 is situated at the front portion of the carcass while the rear wall 102 is at the rear portion of the carcass. The undermount drawer slide 110 is shown in the closed position in FIG. 3 and in the full opened position in FIG. 4. In addition, a partial view of the
10 drawer 80 is displayed with drawer front 82, drawer sidewall 84, and drawer bottom 86. The rear wall of the drawer has been omitted but it is understood that it would conform to the illustration of a rear wall as described for FIG. 2 above, including the drawer back mounting hole. It should be noted that the rear wall and the face frame portion are only partially represented here for the purposes of explaining the invention and, normally, the
15 carcass would be comprised of frames, or walls that extend lengthwise for substantially the whole height of the cabinet dimensions.

[0053] The undermount drawer slide is further comprised of the cabinet member 112, which has an array of 32 mm mounting holes 114, and which is engaged with the rear-
20 mounting bracket 116. Also, the intermediate member 120 and the drawer member 130 can be seen, and near the front portion of the assembly, as shown in FIG 4, is the quick connect 132 which fastens the drawer to the drawer member in the front, and the drawer

member tab **134** which serves to fasten the drawer in the back (through the drawer back mounting hole which is not shown in this view).

[0054] It can be appreciated that the three membered slide arrangement allows the drawer to be fully extended which would not be the case normally for a two membered slide arrangement. This capability has made the three membered slide product the more desirable design in the marketplace although it does not represent all of the applicable undermount drawer slide products that an end user may consider.

[0055] Turning now to FIGS. 5, 6 and 7, the profiles of the drawer member, intermediate member and the cabinet member respectively are shown. These members resemble the corresponding prior art members in large part and as such the profiles are not specifically the focus of the present invention. Some differences do exist and facilitate or support aspects of the present invention.

[0056] The drawer member **130** is displayed with the drawer member front flange **122**, the drawer member stop **124**, the drawer member web **126**, the drawer member side flanges **128**. The drawer member tab **134** with the drawer member tab point **136** is disclosed.

[0057] The intermediate member **120** is shown in FIG. 6 with the intermediate web **140**, the intermediate member inside flange **142**, the intermediate member exterior flange **144**, the intermediate member stops **146**. The intermediate member also includes the inside

runner 160, the exterior runner 162, the inner stops 164, the intermediate member front stops 166 and the intermediate member rear stops 168. For purposes of the present application, reference to “interior” and/or “exterior” means locations towards the center of the drawer or towards the sidewall of the drawer respectively.

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[0058] The cabinet member 112 disclosed in FIG. 7 includes the cabinet member mounting flange 154, with flange holes 156, the gusset 157, the cabinet member web 158, the cabinet member inside flange 159, the cabinet member top flange 150 and the cabinet member stops 152.

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[0059] The rear mounting bracket 116 is disclosed in FIG. 8 and includes the rear mounting bracket holes 172, the rear mounting bracket adjustable holes 174, the bracket back 170, the bracket flange 176 and the bracket slide mount 178.

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[0060] In the usual application, the undermount drawer slide is fitted in between the carcass and the drawer with the drawer being held to the drawer member by means of the quick connect at the front, and the drawer member tab at the rear. The drawer member tab actually penetrates the drawer back through the drawer back mounting hole, which allows the drawer to be inserted first onto the drawer in this fashion and then to be

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connected to the quick connect. The actual means by which the quick connect fastens the drawer to the drawer member will be discussed separately below.

[0061] The drawer member, the intermediate member and the cabinet member are all telescopically interconnected and since the cabinet member is fixed to the carcass, the other two are allowed to freely move into the open position as has been shown in the drawings. The rear portion of the cabinet member is fixed to the rear wall of the carcass by means of the rear mounting bracket which through the bracket slide mount, slidably engages a corresponding slotted portion on the cabinet member. The cabinet member is also fixed to the carcass by way of screw fasteners which can be inserted through the 32 mm mounting holes and into the frame or panel forming the carcass, which is applicable for the situation. As will be discussed below, the members have carriages in between that assist in the telescopic movement as well as transferring and distributing the loads placed on the members.

[0062] FIG. 9 reveals the orientation of the bottom carriage 180 on a portion of the cabinet member 112. The bottom carriage further includes the bottom carriage frame 182, the bottom carriage rollers 184 and the bottom carriage stop 186.

[0063] Continuing in FIG. 10, the bottom carriage can be seen in more detail, and how it is limited in its travel by the cabinet member front stop 190 and the cabinet member stops 152. Also shown in this view are the self closer mounting tabs 192 which will be discussed in more detail below. The bottom carriage in this view is shown as a conventional type without on-board stops or dampeners which are a part of the present invention.

[0064] FIG. 11 discloses an intermediate member with roller carriages disposed about its long axis. Specifically, the intermediate member 120, generally includes web portion 140, the inside flange 142, the exterior flange 144, the intermediate member stops 146, the inside runner 160, and the exterior runner 162. In addition, the front roller carriage 200 and the mid roller carriage 210 can now be seen. The front roller carriage includes the front roller carriage rollers 202, the front roller carriage upper frame 204, the front roller carriage lower frame 206 and the front roller carriage stops or dampeners 208. The mid roller carriage is comprised of the mid roller carriage upper frame 212, the mid roller carriage rollers 214, and the mid roller carriage lower frame 216. Also shown are the rail rollers 220 and the rail roller axles 222.

[0065] The bottom carriage and the roller carriages both work in similar ways. They both utilize rollers that are oriented about the member profiles so as to provide rolling surfaces when contacting the corresponding member surface. In this fashion, the loads placed upon the undermount slide assembly are transferred from the drawer, to the drawer member, to the intermediate member and then to the cabinet member, all the while providing telescoping movement. The travel of the carriages is limited by the stops that are placed appropriately for the desired length of extension required for each member. Carriages may be provided with stops or dampeners which will greatly reduce the shocks of impacts when member reaches a stopping point (either in an open or fully extended position or in the closed position). As shown, the front roller carriages do have such stops or dampeners and the particular version shown are a prior art design. The

carriages of the present invention have improved upon the prior art designs and the specific enhancements will be discussed in more detail herein.

[0066] The last general component of the undermount drawer slide assembly to consider is revealed in FIGS. 12 and 13. The drawer member **130**, includes the drawer member front flange **122**, the side flanges **128**, the web portion **126**, the drawer member tab **134** and the tab point **136**. The drawer member also includes the drawer member front portion **240**, the drawer member rear portion **242**, the engagement flange **244**, the engagement opening **246**, the drawer member rear stop **248** and the drawer member notch **250**.

[0067] FIG. 14 discloses a bottom carriage **270** of the present invention, which includes the bottom carriage top **272**, the bottom carriage bottom **274**, the bottom carriage frame **276**, the bottom carriage frame web **278**, the bottom carriage frame holes **280**, the bottom carriage rollers **282**, the bottom carriage end portion(s) **284**, and the bottom carriage dampener or stop **286**. The bottom carriage dampener also includes the front coil **288** and the rear coil **290**.

[0068] As has been seen herein, the bottom carriage is slidably located in between the cabinet member and the intermediate member. In use, the bottom carriage is free to move within the space enclosed by the two members until it reaches the stopping point for either the fully extended or open position (the intermediate member can reach a fully extended position without the drawer slide assembly as a whole reaching the fully opened

position) and also the stopping point for the fully closed position. When this happens, the bottom carriage dampener is intended to contact the cabinet member front stop 190. The bottom carriage may continue to move once contact occurs, and additional stops are provided for secondary stopping purposes, however, it is the intention of the present invention to provide for a cushioned stopping action that is realized when the bottom carriage dampener is the first to reach a stopping element or when the bottom carriage dampener is impacted by a stopping element on the other end, either simultaneously or secondary to any front stopping.

10 [0069] Once the initial contact with the stop occurs, and no matter where it occurs, the bottom carriage dampener(s) receives the impact load on the forward portion of the front coil as can be understood from the drawings. This load is transmitted evenly across the forward portion of the first coil owing to its elliptical configuration, and at the same time the front coil is compressible and may elastically compress as the impact force is

15 dissipated. Transmittal of the impact force continues to the second coil, if need be, and although there is no direct contact between the stopping element and the second coil, it does receive the loading of the impact force and when the impact is sufficiently hard, the second or rear coil will likewise compress in a uniform manner, thereby dissipating the loads evenly and gradually. This even distribution of loads would be expected to

20 minimize the impact more than the dampeners used in the prior art devices and the expectation is that the durability of the components have thereby been improved as well.

[0070] The impact force may also be dissipated through the bottom carriage frame, more specifically, through the frame web with its series of frame holes. The openings or holes provide a measure of additional elastic deformation potential across the length of the bottom carriage frame if the impact loadings exceed the capability of the dampener

5 portion of the bottom carriage to do so. This is not meant to be a primary method for absorbing the loading, although it serves as a tertiary measure when the application is severe. Providing for some dissipation across the length of the bottom carriage frame, it is believed, will reduce the likelihood for fracturing of the frame to occur as would be the case for the prior art carriage devices. Additionally, the inclusion of the bottom carriage
10 frame holes reduces the material commitment for the manufacture of the product.

[0071] Similar treatment is found with respect to the roller carriage 300 of the present invention. As shown in FIG. 15, the roller carriage includes the roller carriage upper frame 302, the roller carriage lower frame 304, the roller carriage rollers 306, and the
15 roller carriage dampener(s) 308. The roller carriage dampener also includes the roller carriage front coil 310 and the roller carriage rear coil 312. The roller carriage front coil also has a roller carriage front coil face 314.

[0072] As may now be understood, the roller carriage dampeners or stops work in a
20 similar fashion as the dampeners associated with the bottom carriage. The dissipation of the impact forces remain nearly identical with the exception that the roller carriage does not have the extent of length that the bottom carriage does and therefore does not dissipate impact forces through holes or openings in the frame.

[0073] Both the bottom carriage and the roller carriage of the present invention can be fabricated as a single piece. The preferred embodiment is to manufacture the bottom carriage frame and the roller carriage frames via plastic injection molding, thereby
5 reducing the need for any assembly, beyond the insertion of the rollers into the spaces provided in the carriage frame. Also, it is understood that the rollers in accordance with the prior art, with preformed axle ends thereon, may be retained within the frame by means of snap-fitting them into receivers for the roller axle ends.

10 [0074] The bottom carriage and roller carriage of the present invention solves problems associated with the non uniform dissipation of impact forces, and with respect to the bottom carriage, also improves on the durability of the device while reducing material requirements.

15 [0075] The quick connect **400** of the present invention may now be discussed fully, and as shown from the top in FIG. 16, includes the quick connect base **402**, the handle **404**, the toggle **406**, the toggle mount **407**, the quick connect stop **408**, the latch spring **410**, the quick connect base top **412**, the quick connect base web **414**, the quick connect web openings or holes **416**, the quick connect base mounts **418**, and the quick connect fastener
20 holes **420**. The latch spring also includes the latch portion **422** and the spring portion **424**.

[0076] The toggle 406 of the present invention is shown in more detail in FIG. 17, and includes the toggle ends 430, the toggle pivot 432, the center hole 434 and the toggle top face 436.

5 [0077] Additional detail of the quick connect device of the present invention is found in FIG. 18 where the quick connect also includes the toggle mount 450, the toggle screw adjust 452, the toggle screw adjust mount 454, and the toggle block 456. The toggle itself is shown from the opposite side and the toggle barrel 442 and the toggle ramp(s) 444 can be seen along with the toggle pin 446 and toggle pin head 448. The quick
10 connect stop 406 is shown with the associated stop face 460.

[0078] Continuing, the quick connect also includes the handle 404 which itself includes the handle stop face 462, the handle pivot 470, the handle pivot through hole 472 and the handle pivot mount 474. The handle pivot mounting hole 476 located on the base is
15 associated with this part of the handle. The handle also includes the handle edge 478, the handle end 480, the latch opening 482, the handle apron 484, the handle body 486, the latch spring mount 488, and the latch guide slot 520.

[0079] The latch spring 410 includes the latch spring mount 488, the latch spring pivot
20 490, the latch spring guide 492, the latch spring arm 494, the latch head 496, the latch faces 498, the thumb release 500, the latch spring body 502, and the spring base 504.

[0080] The quick connect base 402 now can be seen with the quick connect base head flange 510, the quick connect base head 512, the latch guide 514, and the latch guide end 516.

5 [0081] Turning now to FIG. 19, the quick connect 400 is shown in the mounted alignment with the front portion 240 of the drawer member. At the forward most position on the drawer member, fitted into the final stop notch 426, is the final stop 425. The quick connect latch head is engaged with the engagement opening in the drawer member (not shown). The final stop has the final stop top 427 and the final stop front 428. In use,
10 the toggle end 430 rests on the final stop top where it is received into a slight recessed area. The other end of the toggle is in a neutral position where the quick connect base is flush with the top of the drawer member.

[0082] The quick connect of the present invention provides a convenient means for the
15 reversible mounting of a drawer onto a drawer member in an undermount drawer slide installation. Reference to FIG. 4 shows the placement of the quick connect device is at the most forward position on the undermount drawer slide. In the usual application, the quick connect device is affixed to the back side of the drawer front by means of screws that are threaded into the drawer front through the quick connect base fastener holes. The
20 top side of the quick connect base therefore resides in close contact with the bottom side of the drawer bottom and in the usual orientation, the quick connect handle edge is oriented towards the interior of the drawer. In this way, the quick connect device is placed so as to be in alignment with the drawer member engagement flange and

engagement flange opening and in particular, the quick connect latch guide becomes positioned on the other side of the engagement opening from the latch head and latch faces. Multiple faces are provided for adapting to any lateral clearances that may develop by means of tolerances that stack up during assembly of the cabinet and/or drawer, or in the undermount drawer slide itself. The engagement provides for affirmative retention of the drawer member to the drawer in this location since the latch faces prevent the reversal or release of the engagement flange from the quick connect latch unless it is acted upon by the user.

[0083] As was mentioned above, the user will typically mount the drawer onto the drawer member by insertion of the drawer member tab and tab point into the opening provided for same in the drawer back. The drawer front is then lowered into place and when the quick connect latch is locked up with the engagement flange, the whole assembly is firmly held in the installed position. It should be understood at this point, that the mirror image installation occurs on each side of the drawer, and the representations and descriptions given herein are meant for a pair of assemblies, inclusive of the present invention, for each drawer application.

[0084] The ease in which the quick connect is latched to the drawer member comes from the combination of the handle and the latch spring. In the preferred orientation, the handle edge is positioned interior to the rest of the quick connect assembly and is addressable by the fingers of either the right or left hand of the user depending on whether the right or left quick connect is being manipulated. Manipulation of the handle

in this fashion causes it to rotate about the handle pivot and to otherwise contact quick connect spring portion and the latch spring pivot which urges the latch spring in an opposing rotation as well. In fact, both quick connects are typically manipulated simultaneously. The thumb of the user then naturally and ergonomically rests on the thumb release portion of the latch spring and when a slight closing pressure is applied between the thumb and fingers of each hand, each handle is urged towards the exterior and the spring is urged towards the interior of the drawer. In this fashion, the latch faces are disengaged from contact with the engagement flange and the drawer may be removed or installed as desired. In fact, as far as installation goes, the latch spring does not need to be retracted but owing to the compatibly formed latch head, it will automatically retract when coming into contact with the engagement flange. As mentioned above, the latch faces will also automatically provide contact for multiple lateral positions as may be required.

[0085] The cooperation between the latch and the spring assemblies of the quick connect may be easily discerned from the drawings. The travel of the handle is limited by contact between the stop face on the quick connect stop and the corresponding handle stop face.

[0086] Of particular note in the present invention, is the inclusion of a vertical adjustment capability with a quick connect device. Reference to the drawings, and in particular the toggle assembly, reveals a toggle that is free to rotate about the toggle pin. When the quick connect is installed onto a drawer and undermount drawer slide, the toggle top face is flush with the top of the drawer member. The toggle end is positioned to engage the

final stop top and elevating the opposing toggle end would then result in a corresponding elevating of the quick connect device, which is itself is attached to the drawer. As may be appreciated from the representation in FIG. 18, the toggle screw adjuster 452 fits into the toggle screw adjuster mount 454 which is itself formed as part of the toggle block 456. The toggle screw adjuster is threaded (not shown) and can be rotatably advanced and retracted the end of which lands on the toggle ramp 444 where it influences the position of the toggle, raising and lowering the drawer when the quick connect is in position.

10 [0087] One advantage of the present invention is the fact that the toggle adjustments are made in an infinite number of increments throughout the range of the toggle screw adjuster. As compared to some prior art devices that have only stepped adjustments, the ability to precisely adjust the drawer is an advantage. Additionally, once the adjustment has been made, the toggle screw adjuster can be retained within its mount and the
15 adjustment remains the same even if the drawer is removed from the undermount drawer slide installation. Again this an advantage over prior art devices where the adjustments can be bumped or altered when the drawer is removed, thus requiring additional effort to reinstall the drawer back into the assembly.

20 [0088] While the quick connect base is preferentially fabricated from zinc die cast, it is possible to fabricate the quick connect base from other materials such as plastic (via injection molding or sintered metal casting, or other methods and materials as one skilled in the art may see fit to employ. Similarly, the toggle, latch spring and the handle, all are

preferentially fabricated from plastic, it is possible to construct these components from die cast metals.

[0089] The toggle screw adjuster is shown as having a Phillips type head for engagement with a driver of same type. It is just as feasible to have a toggle screw adjuster that uses a finned or winged end for gripping by the fingers of a user. In terms of making adjustments without having to retain line-of-sight with the top of the toggle screw adjuster, it is preferential to use an alternate terminus for this purpose, especially one that can be manipulated by hand rather than by insertion of a tool.

[0090] Turning now to the embodiment of the present invention disclosed in FIGS. 20 through 25, a self closer 600 is shown as installed on a portion of an undermount drawer slide assembly, and in both the closed position (FIG. 20) and in the open position (FIG. 21). Specifically, the self closer 600 of the present invention is installed on a cabinet member 602 and is in close proximity with a drawer member 604. The self closer is affixed to the cabinet member by means of cabinet tabs 606 which project through and grip onto the self closer mounts 616. The self closer also comprises the self closer body 610, the shuttle 612, the self closer apron 614, the self closer latch 620, the self closer safety stop 622 and the self closer stop 624.

[0091] In FIGS. 22 and 23, the self closer bottom 630 is shown as being integral with the self closer living hinge 632. Also, the self closer rear opening 634 and the rear spring mount 636 can be seen in these views.

[0092] Turning to FIG. 24, the self closer body 610 is shown without the living hinge and the self closer bottom. The view of the interior of the self closer body reveals the self closer latch 620, the spring chamber 642, the shuttle track 644, the forward track stop 646
5 and the rear track stop 648.

[0093] The shuttle 612 is shown in more detail in FIG. 25 and includes the shuttle base 650, the shuttle spring mount 652, the shuttle spring opening 654, the rear shuttle safety stop block 656, which is itself comprised of the rear shuttle pin 658 and the rear shuttle
10 brace 660. Also included in the shuttle is the rear shuttle guide 662, the rear shuttle notch 664, the rear shuttle guide 670, the front shuttle guide 672, the shuttle stop tab 674, the shuttle latch tab 676, the engagement slot 678, the rear engagement block 680, the intermediate engagement block 682, the front engagement block 684, with corresponding rear engagement surface 690, the intermediate engagement surface 688, and the front
15 engagement surface 686. The shuttle also includes the stepped portion 692.

[0094] As may now be realized, a portion of the shuttle slidably rides within the self closer, captured within the self closer body and the self closer bottom. The shuttle rear and forward guides are likewise captured within the shuttle track and the shape of the rear
20 guide in particular is given a roughly triangular shape so as to allow the front guide to follow the track run as it turns 90 degrees and comes to rest within the forward track stop as it is moved to its forward most position.

[0095] The portion of the shuttle that is captured within the self closer body is defined in part by the stepped portion 692 on the shuttle. As the shuttle progresses from the forward most position to the rear position, the shuttle will orient itself from a position that is at an angle to the long axis of the self closer body, to become more parallel as the forward guide moves out of the portion of the shuttle track that is the forward track stop. When this transition occurs, the shuttle guides will be substantially in straight line alignment with each other and the shuttle itself will scribe a straight line as it continues its travel to the rear most (closed) position.

[0096] The action of the shuttle within the self closer body is revealed even more by considering the shuttle positions as the self closer is shown in the "Closed" and "Open" conditions in FIGS. 20 and 21. The actuation of the shuttle, causing it to be moved from one position to the other, is the result of the shuttle contacting the drawer engager 608 (see also the self closer pin 66, in FIG. 2). Essentially, the drawer engager is a 90 degree steel pin that is welded to the desired location on the sidewall of a drawer member, in such alignment as to contact the shuttle at the rear engagement surface when returning to the closed position, and the intermediate and front engagement surfaces when the shuttle is moving to the open position. The impact of the contact is absorbed by the respective rear, intermediate and front engagement blocks.

[0097] When the shuttle is in the closed condition, the shuttle stop tab 674 rests on the self closer stop 624. This is the preferential condition, although if the closing force overcomes this, the shuttle safety stop will contact the self closer safety stop.

[0098] The spring is not shown in the drawings although it is understood to be connected from the self closer rear spring mount 636, threaded through the self closer rear opening 634 and then connected to the shuttle by threading it through the shuttle spring opening 5 654 and then attached to the shuttle at the spring mount 652. Spring tension remains on the shuttle at all times as it moves through its positions.

[0099] In the open or forward most position, the shuttle is angled in relation to the self closer body and this exposes the engagement slot 678 to the drawer engager. Since the 10 shuttle only travels a matter of inches, once it is retained in the open position, contact with the drawer engager is broken and the drawer member can continue to extend without any engagement with the self at all. It is only when the drawer member returns to a position near a closed position that the drawer engager is now in close relation to engage the shuttle. In so doing, it contacts the rear engagement surface which urges the shuttle 15 out of the angled position and once it is substantially parallel with the line of travel of the drawer member the shuttle is released from the forward track stop and the self closer latch and the spring tension will cause the shuttle to impart a closing bias to the drawer member, urging it to the predetermined closing position.

20 [0100] The present invention, now understood as to its function within the undermount drawer slide installation, is substantially improved over the prior art which, in one example, relied upon the mounting of a self closer body directly to the surface of the drawer member flange to form the bottom of the self closer device. This prior art device

had the advantage of needed less material, however, this meant that in order to install the device on a drawer slide, it would have to be assembled virtually on the spot, by threading the spring between the self closer body and the shuttle, placing and orienting the shuttle within the self closer body, and then placing the components while in this semi-assembled condition, in the appropriate location on the drawer member and then affixing them to the drawer member. All of which requires no small amount of dexterity and skill not to mention the then-present availability of all of the component parts in sufficient quantity to match the production requirements for the drawer slides.

[0101] By contrast, the present invention allows for the self closer to be assembled elsewhere, by going through the same process of inserting the spring to the self closer body and to the shuttle, but the shelf closer of the preferred embodiment has a bottom that is linked to a living hinge running the length of the self closer body. When the component parts are in their proper position, the bottom may be closed over the self closer body, thereby enclosing the spring and shuttle in the desired placement, and the self closer bottom may then be solvent welded to the self closer body, or it may be welded by means of ultrasonic welding, or by any other fixing means known to one skilled in the art. The end result is an independently functional self closer that can be held in inventory until required for installation on the subject undermount drawer slides. This advantage not only improves the efficiency of drawer slide manufacturing, but the improved self closer of the present invention is easier to assemble.

[0102] In addition to the foregoing, the self closer bottom has an apron portion upon which the outboard portion of the shuttle rests. There is an advantage in having the shuttle ride completely on a surface formed from the apron and bottom of the self closer, since the preferred material of fabrication for the self closer is plastic. A plastic can be
5 selected that has lubricious qualities which will enhance and improve the sliding action of the shuttle within the self closer body and on the self closer bottom and apron. As compared to prior art devices that utilize the surface of the drawer member, there is less binding and less friction that is developed which will increase the longevity of the self closer overall and which, it is believed, prevent forced movement of the shuttle during
10 binding which would lead to immediate and unpredicted failure of the device.

[0103] The integration of a living hinge and self closer bottom to the body of the self closer achieves a level of economy in manufacturing since the unit can be plastic injection molded as one complete part. This is the preferred embodiment of the present
15 invention although it is noted that the benefits of the invention can be practiced with a self closer bottom and/or apron that are provided as a separate component from the self closer body.

[0104] The features and benefits of the present invention, and its various embodiments,
20 as described herein, are illustrative of the concepts of the applicant and aren't meant to be limiting or restrictive as to the reasonable extensions and variations that may be made from the teachings herein.